Poly Systems USA, Inc.

Tel: (201) 437-1628, (800) 696-9520
Fax: (201) 437-0366
Plant: P.O.Box 49
39 Ave. C., Bayonne, NJ 07002

Solvon®

Ronald L. Shubkin, Manager - Technical Services, **Tel**: (225) 751-7778**, e-mail:** shubkin@solvon.com

Air Radiation Docket
Environmental Protection Agency

Attn: Docket ID No. OAR 2002 0064

Re: Comment on Flammability of n-Propyl Bromide as Discussed in Proposed Rule Published in Federal Register Vol. 68, No. 106, June 3, 2003.

The discussion of flammability (Section IV-D) in the Proposed Rule is generally accurate, but becomes confused by the undocumented reference (on page 33303) to reports of flashpoints for n-propyl bromide (nPB). These reports are wrong and misleading. Also, no reference is made to the reports of flashpoint tests carried out by independent laboratories and submitted to the EPA. These reports show conclusively that n-propyl bromide does not have a flashpoint. n-Propyl bromide has been repeatedly tested following the ASTM D56 (Tag Closed Cup) and the ASTM D93 (Pensky-Martens Closed Cup) protocols, and it has never exhibited a flashpoint. It has also failed to show a flashpoint under various "open cup" methods such as the Cleveland Open Cup.

Some of the confusion in reporting the results of flashpoint testing lies in the definition of a flashpoint. A flashpoint test consists of passing a pilot light over the surface of the liquid being tested. If the vapors of a liquid are flammable (i.e., capable of sustaining combustion), the flame front will propagate from the pilot light to the liquid surface. The temperature at which this flame propagation happens is called the flashpoint. The National Fire Protection Agency (NFPA) gives a number of definitions of flashpoint in its Glossary of Terms, but they all include the phrase, "The minimum temperature at which a liquid gives off vapor sufficient to form an ignitable mixture in air **near the surface of the liquid**." n-Propyl bromide does not exhibit this behavior under the conditions of the ASTM D56, the ASTM D93 or the Cleveland Open Cup methods.

The vapors of n-propyl bromide can be combusted in an external source of ignition. The result of this characteristic in the performance of a flashpoint test is that the pilot light may be briefly enhanced before it is extinguished. In this case, the enhanced flame is **above the pilot light and not near the surface of the liquid**, as required by the various NFPA definitions. Enhancement of the pilot light is also typical of hydrochlorocarbons that are classified as non-flammable (i.e., methylene chloride, trichloroethylene, etc.). The mistaken interpretation of pilot light enhancement for flashpoint has led at times to the erroneous identification of n-propyl bromide as a flammable liquid. This was particularly true in the earlier literature, and the misrepresentation could be found in many standard databases, including literature from some of the manufacturers of n-propyl bromide.

Another source of misinformation concerning the flammability of n-propyl bromide has come from the determination of flashpoints outside of the acceptable temperature range for the test being employed. Dr. Elisabeth Brandes of the German National Flammables Laboratory presented data to the European Chemicas Bureau (ECB) that indicated that n-propyl bromide has a flashpoint of -10°C. The ECB was reviewing the flammability status of n-propyl bromide for

the European Commission (EC). The International Brominated Solvents Association (IBSA) commissioned Chilworth Technology Limited in the U.K. to determine if the data from Dr. Brandes were valid. In a report from Chilworth Technology, Dr. Stephen Rowe (Technical Manager, Process Safety Laboratory) reported that n-propyl bromide does have a flashpoint of –5°C to –1°C when measured using the Pensky-Martens non-equilibrium apparatus employed by Dr. Brandes. He also found that dichloromethane (methylene chloride) has a flashpoint using this method. However, Dr. Rowe points out that the method employed is not valid outside the temperature range of +10°C to +110°C. He states that the temperature range is clearly stated in the ISO 1523 standard. He goes on to add that there are alternative methods detailed in ISO 1523 which are valid down to –30°C. These methods include the Abel, Tag and Abel-Pensky apparatus. In fact, Dr. Brandes had reported no flashpoint for n-propyl bromide when using these alternative, valid methods.

Dr. Rowe also tested three non-flammable fluorocarbon ether solvents using the Pensky-Martens closed cup method employed by Dr. Brandes. In a report to IBSA dated May 10, 2002, Dr. Rowe states that he found ignition for HFE-72DE at –9°C, for HFE-71DE at –16°C, and for HFE-71DA at –14°C. The "non-flammable" status of these solvents has never been questioned.

Finally, under the Occupational Safety and Health Standards (29 CFR 1910.1200) of OSHA, a flammable liquid is defined as having a flashpoint at or above 100°F (37.8°C), but below 200°F (93.3°C). n-Propyl bromide has no flashpoint up to its boiling point of 71°C, and clearly is non-flammable under this definition.

Sincerely Yours,

Ronald L. Shubkin, Ph.D., MBA
Manager, Technical Services

Richard DeGroot
Director, Research and Development

Dov Shellef
President
Poly Systems USA, Inc.